Citation:

Dos Santos Silva I, Mangtani P, McCormack V, Bhakta D, Sevak L, McMichael AJ. Lifelong vegetarianism and risk of breast cancer: a population-based case-control study among South Asian migrant women living in England. *Int J Cancer.* 2002 May 10;99(2):238-44.

PubMed ID: 11979439

Study Design:

Case-Control Study

Class:

C - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To investigate the role of lifelong vegetarianism on the etiology of female breast cancer.

Inclusion Criteria:

- Cases were women of South Asian ethnic origin, <75 y old, with newly diagnosed breast cancer, born in Indian subcontinent or in East Africa, and living and reported to the Thames and West Midlands cancer registries during the study period and alive at time of the reporting.
- Controls were individually matched to the case on year of birth within 5 y and were randomly selected from all South Asian female patients born in the Indian subcontinent or East Africa who were registered with the same general practitioner as the case at diagnosis.

Exclusion Criteria:

- Cases registered >2 years after diagnosis
- Previous diagnosis of any cancer, conditions requiring strict diets (including insulin-dependent diabetes mellitus), mental or psychiatric disorders that would affect the accuracy of elicited information

Description of Study Protocol:

Recruitment

Letters, after permission of their general practitioner, to women in the Thames (December 1995-March 1999) and West Midlands (July 1997-May 1999), England cancer registries.

Design: Case-Control Study

Blinding used (if applicable)

- Women blinded to the fact that the study was about breast cancer
- Interviewers blinded to the status of whether a case or control

Intervention (if applicable): not applicable

Statistical Analysis

- Conditional logistic regression models with each case and her two age- and GP-matched controls.
- Nutrient intake was estimated by using the residuals of the regression of the nutrient on total energy intake.
- Quartiles of food consumption and nutrient residuals were defined according to the distribution in the controls.
- The cut-off points that define the energy-adjusted nutrient quartiles correspond to 1,826 kcal, the median energy intake in controls.
- Tests for trend in the odds of breast cancer with food/nutrient quartiles were based on the likelihood-ratio test between the models.

Data Collection Summary:

Timing of Measurements

- 15 months between case diagnosis and interview
- FFQ was done before completing the questions in the general health section.
- Anthropometrics were done last.

Dependent Variables

- Breast cancer

Independent Variables

- Lifelong vegetarianism
- Habitual diet 2-3 y before the interview: Food Frequency Questionnaire including foods of various South Asian ethnic subgoups. Nutrient analysis using COMP-EAT. The FFQ was validated against the average of 12 monthly 24 h dietary recalls collected from each of a subset of 100 controls who were in the study.

Control Variables

Description of Actual Data Sample:

Initial N: 352 potentially eligible cases after application of exclusion criteria.

Attrition (final N): 240 cases, 480 controls.

- 49 excluded because the patients and/or their GPs could not be traced
- 62 excluded because the patients and/or their GPs declined to participate
- 1 excluded because it was not possible to obtain appropriate controls

Age: 51.45 years for cases and 51.87 years for controls

Ethnicity: South Asian

Other relevant demographics: same time since migration to United Kingdom but cases were more likely to come from Pakistan. Cases had a higher educational level and current social class, younger onset of menarche, older at birth of first child and less likely to have ever breastfed but more likely to have a positive family history of breast cancer and parents who were first-degree relatives than the controls.

Anthropometrics Alcohol intake was reported in 8.3% of cases and 6.5% of controls. No difference in height, BMI, waist:hip ratio, use of oral contraceptives or hormone replacement therapy.

Location: United Kingdom

Summary of Results:

Key Findings

- Lifelong vegetarianism had a slight but not statistically significant reduction in the odds of breast cancer relative to lifelong meat-eaters (odds ratio = 0.77, 95% confidence interval = 0.50, 1.18). The finding was not affected by adjusting for socio-demographic or reproductive variables or by height, current BMI or use of oral contraceptives or hormone replacement therapy.
- There was no linear trend in the odds of breast cancer with increasing intake of meat dishes among current meat-eaters (p=0.23), although the odds were higher for the top 75%.
- Strong inverse linear trend in the odds of breast cancer with increasing intake of vegetables (P = 0.005), pulses (P = 0.007) and fiber (non-starch polysaccharides, P = 0.02) but not with breads or fruits.
- Adjustment for intake of vegetables and pulses reverted the odds of breast cancer in lifelong vegetarians relative to lifelong meat eaters (odds ratio = 1.04, 95% confidence interval: 0.65 - 1.68) and attenuated the quartile-specific estimates for meat intake, whereas the inverse trends in the odds of breast cancer with intake of vegetables and pulses remained after adjustment for type of diet or meat intake

Other Findings

- Lifelong vegetarians differed from meat-eaters in meat consumption and in intake of vegetables and fruit.
- Among controls, lifelong vegetarians had a higher daily intake of vegetables (332 g vs. 249 g) and pulses, lentils and dhals (92 g vs. 46 g) than meat-eaters but similar consumption of fruit (1.6 servings vs. 1.6 servings) and bread (184 g vs. 175 g).
- There were no associations between intakes of total energy, fat, protein and carbohydrates and the odds of breast cancer.
- There was a strong inverse association between the odds of this cancer and intake of non-starch polysaccharides (NSP) (p=0.02 for linear trend) with women in the highest 25% having only 61% odds of those in the lowest quartile.
- This linear trend corresponded to an odds ratio of 0.83 [95% confidence interval (CI)=0.70-0.98; p=0.02] per unit increase in NSP quartile.
- There was a marginal statistically significant inverse linear trend in the odds of breast cancer

with intake of NSP from vegetables and pulses, but not from cereals or fruits.
- The effect of NSP on breast cancer was similar among vegetarians and meat-eaters, with vegetarians in the top 25% of NSP intake having only 62% (95% CI=0.26-1.49) of the odds of those in the bottom 25%.
- Meat-eaters in the top 25% of NSP intake had only 47% (95% CI=0.24-0.95) of the odds of those in the lowest 25%.
- The effect of lifelong vegetarianism on breast cancer was slightly stronger among women who migrated to the UK via East Africa than in those who came directly to the UK.
- There was no evidence that the effect of lifelong vegetarianism was modified by menopausal status (p=0.17) or by time from diagnosis to interview of the cases (p=0.61)

Author Conclusion:

The findings from the present study seem to suggest that lifelong vegetarianism may be associated with a reduction in the risk of breast cancer through its association with a higher intake of vegetables and pulses. Although it is not possible to exclude the possibility that meat abstention may also play a role, the findings provide evidence that a lifelong diet rich in vegetables, such as those typically found in South Asians diets, may be protective against this cancer.

Reviewer Comments:

Authors note the following limitations:

- *Cases were identified from population-based cancer registries but case ascertainment by registries was probably incomplete*
- *There were delays between diagnosis and registration, with some cases dying before registration or before it was logistically possible to organize a home interview*
- *Selection bias might have been introduced*
- *As migrants with similarities tend to concentrate in certain geographical areas and controls were selected from the same GP practices as cases, there is a possibility that both grups would have similar diets*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes

4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	Yes
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes

7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes